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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,043	08/10/2006	Hideki Oki	S1459.70129US00	4064

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EXAMINER	
BEST, ZACHARY P	
ART UNIT	**PAPER NUMBER**
1727	
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12/15/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/589,043	OKI ET AL.	
	Examiner	Art Unit	
	Zachary Best	1727	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 September 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

ELECTROCHEMICAL DEVICE AND ELECTRODE SUITABLE FOR USE IN PRIMARY AND/OR SECONDARY BATTERIES

Examiner: Z. Best S.N. 10/589,043 Art Unit: 1795

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 20, 2010 has been entered. Claims 21-22 were amended. Claims 23-24 were newly added. Claims 1-24 are currently pending examination.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. Claims 1-20 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman et al. (US 4,894,302) in view of Mayes et al (US 2002/0048706 A1) and Sato et al. (US 2002/0122985 A1).

Regarding Claim 1, Hoffman et al. teach an electrochemical device, which comprises a first pole (3), a second pole (2), and an ionic conductor (4), wherein said first pole

containing an active material comprising Ru or Co (col. 5, lines 61-65, Group 8), and said ionic conductor containing Mg, Al, or Ca (Hoffman et al. claims 1-2), and a conductive material comprising graphite or carbon (col. 6, lines 3-6 and col. 8, lines 27). However, Hoffman et al. fail to teach said active material has an average particle diameter as small as 1 nanometer and a conductive material comprising a mixture of fine graphite powder and fine carbon powder, wherein fine carbon powder has particle diameters on the order of nanometers.

Sato et al. teach an active material powder mixture for batteries (abstract, see also claim 1), comprising a conductive carbonaceous material created from a mixture of graphite and carbon black having a particle size on the order of nanometers (par. 78) so as to increase the contact area between the conductive material and the active material (par. 15). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to create the electrochemical device of Hoffman et al. and Mayes et al. having a conductive carbonaceous material created from a mixture of graphite and carbon black having a particle size on the order of nanometers because Sato et al. teach it will increase the contact area between the conductive material and the active material (par. 15).

Regarding Claim 2, Hoffman et al. teach the electrochemical device of the first pole is manganese oxide or cobalt oxide (col. 5, lines 65-68).

Regarding Claim 3, Hoffman et al. teach said cobalt oxide (Co_3O_4), which has a ratio of M/X of 0.75.

Regarding Claim 4, Mayes et al. teach the active material particle size is about 30 nm or preferably smaller than 10 nm (par. 106).

Regarding Claim 5, Hoffman et al. teach the first pole is formed from the active material mixed with a conductive material and a polymeric binder (col. 6, lines 3-14).

Regarding Claim 6, Hoffman et al. teach said ions from the ionic conductor are Mg, Al, or Ca (Hoffman et al. claims 1-2).

Regarding Claim 7, Hoffman et al. teach said second pole contains magnesium or calcium (Hoffman et al. claim 2).

Regarding Claim 8, Hoffman et al. teach said ionic conductor is an electrolytic solution (Hoffman et al. abstract) or suggest a solid electrolyte (col. 2, lines 59-62).

Regarding Claim 9, Hoffman et al. teach said electrochemical device is a secondary battery (rechargeable, col. 1, lines 37-39).

Regarding Claim 10, Hoffman et al. teach an electrochemical device, which comprises a first pole (3), a second pole (2), and an ionic conductor (4), wherein said first pole containing an active material comprises managenese oxide or cobalt oxide (col. 5, lines 61-68, Group 8), and said ionic conductor containing Mg, Al, or Ca (Hoffman et al. claims 1-2), and a conductive material comprising graphite or carbon (col. 6, lines 3-6 and col. 8, lines 27). However, Hoffman et al. fail to teach said active material has an average particle diameter as small as 1 nanometer and a conductive material comprising a mixture of fine graphite powder and fine carbon powder, wherein fine carbon powder has particle diameters on the order of nanometers.

Mayes et al. teach an electrochemical cell comprising an electrochemical reaction wherein an ion conductive species is intercalated into a host material during the electrochemical reaction (par. 7), wherein the ion host particles preferably less than 10 nm in diameter because the use of finer particles minimizes the detrimental effects of volume change occurring naturally during the intercalation of the ion conductive species (par. 106), and the ion host particles are mixed with a conductive material such as a mixture of carbon black and graphite (par. 165). Mayes et al. further suggest the ion conductive species may be calcium or magnesium ions (par. 103). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the active material of Hoffman et al. have an average particle diameter as small as 1 nm Mayes et al. teach that smaller particle sizes in electrochemical cells where intercalation occurs minimize the detrimental effects of volume change of the host material. Discovery of an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272 (CCPA 1980).

Sato et al. teach an active material powder mixture for batteries (abstract, see also claim 1), comprising a conductive carbonaceous material created from a mixture of graphite and carbon black having a particle size on the order of nanometers (par. 78) so as to increase the contact area between the conductive material and the active material (par. 15). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to create the electrochemical device of Hoffman et al. and Mayes et al. having a conductive carbonaceous material created from a mixture of graphite and carbon

black having a particle size on the order of nanometers because Sato et al. teach it will increase the contact area between the conductive material and the active material (par. 15).

Regarding Claim 11, Hoffman et al. suggest that the active material is a mixture of a plurality of compounds ("at least one"), each of the plurality of compounds being represented by the general formula MX (col. 5, lines 61-68).

Regarding Claims 12-13, Hoffman et al. teaches the intercalation occurs to a degree of a maximum characteristic for each host structure, and beyond said degree the crystal structure will change, which is detrimental to the material (col. 7, lines 9-21). It is reasoned that if the crystal structure remains unchanged the crystal state will also remain unchanged because a change in crystal state would inherently change the crystal structure.

Regarding Claims 14-15, Hoffman et al. teach said active material is manganese oxide (Mn_2O_3), which has a ratio of M/X of 0.66.

Regarding Claims 16-17, Mayes et al. teach the active material particle size is about 30 nm or preferably smaller than 10 nm (par. 106).

Regarding Claim 18, Hoffman et al. teach said ions from the ionic conductor are Mg, Al, or Ca (Hoffman et al. claims 1-2).

Regarding Claim 19, Hoffman et al. teach said second pole contains magnesium or calcium (Hoffman et al. claim 2).

Regarding Claim 20, Hoffman et al. teach the first pole is formed from the active material mixed with a conductive material and a polymeric binder (col. 6, lines 3-14).

Regarding Claims 23-24, Hoffman et al. teach an open circuit voltage of 1.2 V (col. 8, line 41) during a laboratory test when the cell was being discharged (col. 8, lines 37-46).

4. Claims 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman et al. in view of Mayes et al and Sato et al., as applied to Claims 1-20 and 23-24 above, and further in view of Chusid et al. (Chusid, Orit, et al. "Solid-State Rechargeable Magnesium Batteries." *Advanced Materials* 15, Nos. 7-8 (2003): 627-30).

Regarding Claims 21-22, Hoffman et al., Mayes et al., and Sato et al., teach the electrochemical device as recited above. However, Hoffman et al., Mayes et al., and Sato et al. fail to teach said ionic conductor comprises $Mg(AlCl_2EtBu)_2$.

Chusid et al. teach a magnesium battery having an electrolyte comprising $Mg(AlCl_2EtBu)_2$ (pg. 628) because it will give the magnesium batteries a temperature and potential range of operation as wide as possible (pg. 628). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to create the electrochemical device of Hoffman et al., Mayes et al., and Sato et al. having an electrolyte comprising $Mg(AlCl_2EtBu)_2$ because Chusid et al. teach it will give the magnesium batteries a temperature and potential range of operation as wide as possible.

Response to Arguments

5. Applicant's arguments filed September 20, 2010 have been fully considered but they are not persuasive.

Applicant argues:

(a) Mayes et al. teach away from the combination of Hoffman et al., Mayes et al., and Sato et al., because Mayes et al. teach the conductive particles are in the particle size range of 10-100 microns, which teaches away from Sato et al. teaching a conductive particle significantly smaller in particle size; and

(b) the combination of Hoffman et al., Mayes et al., and Sato et al. are not easily combinable because electrochemical devices are typically difficult and unpredictable.

In response to Applcant's arguments:

(a) Applicant seems to be arguing that because Mayes et al. does not envision using conductive particles in the electrode having particle size on the order of nanometers, that Mayes et al. therefore teaches away from any other embodiment obvious to one having ordinary skill in the art. Examiner understands that Mayes et al. specifically recite "typically on the order of no less than about 100 microns" (par. 24) in the Background of the Invention section. More pertinent to the teachings of Mayes et al., it is taught that the conductive particles "tend to have a size in the 10 to 100 micron range." However, Mayes et al. specifically do not recite any teaching that rises to the level of "teaching away" from any further art relevant to the particle size of the conductive particles. Conversely, Mayes et al. specifically use the open term "tend to" when teaching conductive particle size because Mayes et al. clearly is open to particle sizes outside of the taught range.

Sato et al. provides ample motivation to use a conductive particle size on the order of nanometers (pars. 15, 78) so as to increase contact area between the active material and the

conductive material therein providing improved electrochemical cell performance (par. 15). Examiner believes that this direct motivation would overcome any alleged inhibition by one skilled in the art taught by the indirect "teaching away" of Mayes et al.

(b) Examiner has carefully considered the secondary considerations set forth by Applicant, wherein Applicant argues that the combination of Hoffman et al., Mayes et al., and Sato et al. is not obvious because creating a working electrochemical device is typically difficult and unpredictable. Evidence pertaining to secondary considerations must be taken into account whenever present; however, it does not necessarily control the obviousness conclusion. See, e.g., *Pfizer, Inc. v. Apotex, Inc.,* 480 F.3d 1348, 1372, 82 USPQ2d 1321, 1339 (Fed. Cir. 2007).

Hoffmant et al., Mayes et al., and Sato et al. are all directed to the art of batteries, which would all be highly relevant and known to those skilled in the art to have battery reactions. Furthermore, it would have been predictable whether the combination as recited above would be stable because Sato et al. specifically disclose that small conductive and active material particles work in an electrochemical cell (par. 78). Applicant has not provided any persuasive evidence to show that the combination would be difficult and unpredictable enough to show there was no reasonable expectation of success. Examiner believes that because all taught elements originate from art with correlating, working electrochemical cells, that one skilled in the art would have a reasonable expectation of success when modifying the particle sizes of the conductive particles and active material.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zachary Best whose telephone number is (571) 270-3963. The examiner can normally be reached on Monday to Thursday, 7:30 - 5:00 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Zachary Best/
Examiner, Art Unit 1727

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1727